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Does practice size matter?

Review of effects on quality of care in primary care

Abstract

Background
There is a trend towards consolidating smaller primary care practices into larger practices worldwide. However, the effects of practice size on quality of care remain unclear.

Aim
This review aims to systematically appraise the effects of practice size on the quality of care in primary care.

Design and setting
A systematic review and narrative synthesis of studies examining the relationship between practice size and quality of care in primary care.

Method
Quantitative studies that focused on primary care practices or practitioners were identified through PubMed, CINAHL, Embase, Cochrane Library, CRD databases, ProQuest dissertations and theses, conference proceedings, and MedNar databases, as well as the reference lists of included studies. Independent variables were team or list size; outcome variables were measures of clinical processes, clinical outcomes, or patient-reported outcomes. A narrative synthesis of the results was conducted.

Results
The database search yielded 371 articles, of which 34 underwent quality assessment, and 17 articles (13 cross-sectional studies) were included. Ten studies examined the association of practice size and clinical processes, but only five found associations of larger practices with selected process measures such as higher specialist referral rates, better adherence to guidelines, higher mammography rates, and better monitoring of haemoglobin A1c. There were mixed results for cytology and pneumococcal coverage. Only one of two studies on clinical outcomes found an effect of larger practices on lower random haemoglobin A1 value. Of the three studies on patient-reported outcomes, smaller practices were consistently found to be associated with satisfaction with access, but evidence was inconsistent for other patient-reported outcomes evaluated.

Conclusion
There is limited evidence to support an association between practice size and quality of care in primary care.

Keywords
health facility size; primary care; quality of health care.

INTRODUCTION

Primary care is the first point of contact a person has with the health system,[1] and primary care practices can play a vital role in helping patients achieve better quality, better outcomes, better cost effectiveness, and better health status.[2] The importance of primary care in delivering high-quality services and care is therefore widely recognised.

Quality of care has been defined as 'the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge'.[3] According to Donabedian, measures of quality of care can be classified into three categories:

- structure, which refers to the facilities, personnel, and policies and other organisational characteristics to deliver medical care;
- processes, which refer to services provided to or for patients; and
- outcomes, which refer to changes in a patient's health status and patient satisfaction

The organisation that a physician works in is a factor that can influence the quality of medical care. Practice size is an organisational characteristic that may influence the processes and outcomes of care in primary care practices. In recent years, there has been some concern that single-handed or smaller practices do not provide as high a quality of care as group or larger practices.[5,6] Further, there has been an increasing trend towards larger primary care practices, owing to the retirement of older GPs from single-handed practices, and interdisciplinary teams to deliver better and more affordable services to patients.[2] The number and proportion of group practices have also grown rapidly in the UK and Taiwan.[7–9]

Some studies have found that larger practices tend to adopt evidence-based care processes, and have the economies of scale to employ staff and effectively use information technologies to implement and assist with quality-improvement processes.[5,10] However, smaller practices performed better in facilitating closer relationships of physicians and staff with patients, and were often regarded by patients as being more accessible, achieving higher levels of patient satisfaction.[10,11]

Apart from the issue of quality, the definition of practice size also varies and is measured differently across countries. The size of primary care practices can range from solo/single-physician practices to group practices. In the US, medical groups are defined as organisations with three or more physicians; independent practice associations (IPAs) are organisations that contract with health maintenance organisations representing large numbers of medical groups and one- and two-physician practices; and hybrids refer to organisations that consist of a medical group and an IPA.[10] In England, practice size is either defined by the number of patients who choose to

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How this fits in

There is concern that smaller practices do not provide as high a quality of care as larger practices. A systematic review and narrative synthesis of 13 studies shows that there is limited evidence to support an association between practice size and quality of care in primary care. Practice size is not the only organisational characteristic that can influence the quality of medical care. Future research should be done to ascertain if other organisational factors such as team climate, financial incentives, and time spent with patient, may have greater impact on the quality of care in the primary care setting.

register with a general practice (practice list), or by the number of GPs, ranging from single-handed GPs to multi-partner practices.[8]

Given the quandary surrounding the definition and quality of care provided by smaller practices, the evidence on the effects of practice size on clinical outcomes has not been conclusive. The aim of this study was to systematically review the effect of practice size on the quality of care in primary care settings.

METHOD

Figure 1 presents a flowchart of the article search and selection process. A search for quantitative studies that examined the relationship between practice size and quality of care in primary care practices or among primary care practitioners (GPs, general internists, paediatricians, family physicians, and obstetrician/gynaecologists) was performed in PubMed, CINAHL, Embase, Cochrane Central Register of Controlled Trials (CENTRAL), CRD databases, ProQuest dissertations and theses, conference proceedings, and MedNar databases. Studies in English published from January 1990 to December 2010 were considered.

A search string of MeSH and non-MeSH terms related to practice size and quality of care were identified, and undertaken for all included databases. Practice size could be measured in terms of practice list size, team size, or practice partnerships, that is, whether or not a practice is in partnership with other practices. Quality of care was defined as any objective measure of clinical process, clinical outcome, or patient-reported outcome, which was data reported directly by the patient, and includes functional status, health-related quality of life, satisfaction with treatment, and treatment adherence.[12]

The titles and abstracts of studies identified from the database search were screened, and full-text copies of studies that met the inclusion criteria (that is, participants, intervention, and outcome measures) were retrieved. If it was unclear from the abstract whether the study met the inclusion criteria, the full-text copy was also retrieved. Two reviewers independently assessed the articles, and disagreements were resolved through discussion. On selection, the reference lists of the studies were searched for additional studies. All selected studies then underwent a quality assessment using a modified critical appraisal checklist from the Joanna Briggs Institute (JBI) critical appraisal checklist for descriptive/case series studies.[13]

Data were extracted using a tool modified from that developed by the JBI.[13] A narrative synthesis of the results was conducted, as a pooled statistical analysis was not possible, owing to the heterogeneity between the studies. In most of the studies, odds ratios were calculated comparing large practices to small practices as the reference group. However, in a few studies, the odds ratios were calculated using large practices as the reference group. For consistent interpretation across all studies, the odds ratios reported in the latter studies were inverted.

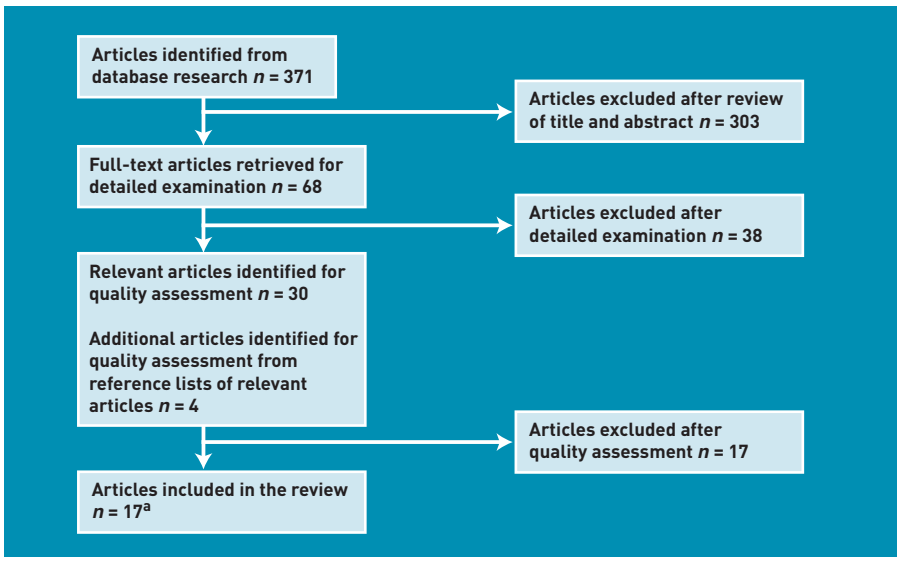

Figure 1. Flowchart of article search and selection process.

RESULTS

Detailed tables of the results are available in a full systematic review from the JBI Library of Systematic Reviews.[14]

Description of studies

A total of 371 articles were identified from the database search. After reviewing the

Table 1. Measures of clinical processes

Study ID	Clinical process	Patient population	Effects of practice size
Use of diagnostic tests			
Abdelhamid *et al*, 2010/Broadbent *et al*, 2008/ Vedavanam *et al*, 2009[17–19]	Diagnosis by spirometry or peak flow	Asthma	No effect
Recording of symptoms			
Abdelhamid *et al*, 2010/Broadbent *et al*, 2008/ Vedavanam *et al*, 2009[17–19]	Asked about difficulty with sleeping, day symptoms, and interference with daily activities	Asthma	No effect
Recording of risk factors			
Abdelhamid *et al*, 2010/Broadbent *et al*, 2008/ Vedavanam *et al*, 2009[17–19]	Presence of suicidal thoughts	Depression	No effect
Majeed *et al*, 2003[25]	Blood pressure, body mass index, and cholesterol	IHD	No effect
Medication prescription			
Abdelhamid *et al*, 2010/Broadbent *et al*, 2008/ Vedavanam *et al*, 2009[17–19]	Oral pharmacological therapy, NSAID, and oral agent	Osteoarthritis	No effect
	Antidepressant	Depression	No effect
Majeed *et al*, 2003[25]	Aspirin, statin, angiotensin-converting enzyme inhibitor, and beta-blocker	IHD	No effect
Patient education			
Abdelhamid *et al*, 2010/Broadbent *et al*, 2008/ Vedavanam *et al*, 2009[17–19]	Natural history, treatment, self-management, and medication risks	Osteoarthritis	No effect
Specialist referrals			
Hugo *et al*, 2000[23]	Referral rate for eating disorder	<65 years	Large practices (RR per unit increase in number of partners = 1.11; 95% CI = 1.07 to 1.16, *P*<0.001)
Timely review			
Abdelhamid *et al*, 2010/Broadbent *et al*, 2008/ Vedavanam *et al*, 2009[17–19]	Regular assessment of functional status and pain	Osteoarthritis	No effect
	Review in last 15 months; predicted peak flow calculated and inhaler technique checked in last 5 years	Asthma	No effect
	Offer of follow-up appointment within 4 weeks of first treatment	Depression	Large practices (OR = 0.93; 95% CI = 0.55 to 1.54)
Adherence to clinical practice guidelines			
Rushton *et al*, 2004[29]	Incorporation of American Academy of Paediatric guidelines	ADHD	Large practices (OR = 2.0; 95% CI = 1.11 to 3.33)
Preventive services			
Bower *et al*, 2003/Campbell *et al*, 2001[15,16]	Childhood immunisation, preschool booster, MMR booster and vaccine	Children	No effect
	Cervical cytology	General	No effect
Hippisley-Cox *et al*, 2001[22]	Immunisation and preschool booster	Children	No effect
	Cytology	General	Large practices (OR = 3.23; 95% CI = 1.19 to 9.09, *P* = 0.02)
Thalanany and Derrough, 2005[27]	Pneumococcal vaccination	≥80 years	Large practices (OR = 1.45; *P*<0.0001)
Pham *et al*, 2005[28]	Influenza, pneumococcal vaccinations	≥65 years	No effect
	Colonoscopy/sigmoidoscopy	65–79 years	No effect
	Mammography	65–74 years	Large practices (OR = 1.40; 95% CI = 1.10 to 1.77)
	Haemoglobin A1c testing	≥65 years diagnosed with diabetes	Large practices (OR = 1.91; 95% CI = 1.40 to 2.60)
	Diabetic eye examinations	≥65 years diagnosed with diabetes	No effect
de Koning *et al*, 2005[31]	Suboptimal preventive care preceding occurrence of stroke	Stroke	No effect
Wenghofer *et al*, 2009[30]	Well care and health maintenance	General	No effect
Management of diseases			
Bower *et al*, 2003/Campbell *et al*, 2001[15,16]	Disease management	Angina and asthma	No effect
	Disease management	Diabetes	Large practices (regression coefficient for number of employed staff = 0.54; 95% CI = 0.12 to 0.96, *P* = 0.014)
Wenghofer *et al*, 2009[30]	Managing patients with chronic and acute conditions, and new presentations	General	No effect

ADHD = attention deficit hyperactivity disorder. IHD = ischaemic heart disease. NSAID = non-steroidal anti-inflammatory drug. OR = odds ratio. RR = rate ratio.

Table 2. Measures of clinical outcomes

Study ID	Clinical outcome	Patient population	Effects of practice size
Majeed *et al*, 2003[25]	Optimal blood pressure, cholesterol, and body mass index	IHD	No effect
Pringle *et al*, 1993[26]	Glycaemic control (measured by random haemoglobin A1c estimation)	Diabetes	Large practices (F = 3.35, *P* = 0.04)

IHD = ischaemic heart disease.

titles and abstracts, 303 articles were excluded and the remaining 68 articles were retrieved for a detailed examination. Thirty-eight articles were further excluded, yielding 30 relevant articles. The reference lists of the 30 relevant articles were searched, and an additional four articles were identified. All 34 articles underwent a methodological quality assessment, after which 17 articles were excluded, leaving 17 articles to be included in the review (Figure 1).

The 17 articles originated from 13 cross-sectional studies. Two articles were separate publications of one study,[15,16] three articles were separate publications of a second study,[17–19] and another two articles were separate publications of a third study.[20,21] Nine studies were conducted in the UK,[15–27] two in the US,[28,29] one in Canada,[30] and one in the Netherlands.[31] Six of the 13 studies focused on primary care practices,[15–19,22,24,25,27] while four looked at primary care practitioners,[28–31] and three examined both primary care practices and practitioners.[20,21,23,26]

In three studies, practice size was measured as a continuous variable of list size in thousands,[20,21,24,25] and in another three studies, practice size was measured as a dichotomous variable comparing single-handed practices against group practices.[22,27,29] Practice size was measured as a categorical variable comparing practices grouped into different sizes in three of the studies,[17–19,26,28] while four other studies used more than one measure of practice size.[15,16,23,30,31] Of the 13 studies, eight examined the effects of practice size on clinical processes,[17–19,22,23,27–31] one on clinical outcomes,[26] and two on patient-reported outcomes.[20,21,24] One study looked at both clinical processes and outcomes,[25] and another study looked at clinical processes and patient-reported outcomes.[15,16]

Effect findings

The included studies used different levels of significance in the reporting of results. In this review, independent variables with $P<0.05$ were reported as significant.

Clinical processes

Table 1 presents the results of the studies that examined the effects of practice size on clinical processes. The measures of clinical processes varied between studies and included the use of diagnostic tests, recording of symptoms, recording of risk factors, medication prescription, patient education, specialist referrals, timely review, adherence to clinical practice guidelines, preventive services, and the management of diseases. Ten of the 13 studies reported effects of practice size on clinical processes.[15–19,22,23,25,27–31]

Of the 10 process measures covered across the studies, only four had significant associations with practice size. Larger practices were found to have higher specialist referral rates for an eating disorder service,[23] were more likely to adhere to clinical practice guidelines for children with attention deficit/hyperactivity disorder (ADHD),[29] to provide better diabetes management,[15,16] and to deliver preventive services such as cytology targets, pneumococcal vaccination, mammography, and haemoglobin A1c testing.[22,27,28]

Clinical outcomes

Two of the 13 studies examined the effects of practice size on clinical outcomes.[25,26] Table 2 presents the results of the studies. One study found that patients with diabetes in larger practices tended to have lower random haemoglobin A1 value,[26] while the other study found no significant association between practice size and clinical outcomes in patients with ischaemic heart disease (IHD).[25]

Patient-reported outcomes

Three studies examined the effects of practice size on patient-reported outcomes (Table 3).[15,16,20,21,24] All three studies demonstrated that larger practices had significantly lower scores for access and treatment by receptionists,[15,16] decreased surgery and consultation satisfaction,[20,21] and decreased satisfaction with getting through on the phone, being able to get an appointment on the same day or in the next 2 days, being able to get an appointment >2 days in advance, being able to get an appointment with a particular GP, and the hours the GP surgery was open.[24]

DISCUSSION

Summary

This review examined the effects of practice size on the quality of care in the primary care setting. Owing to the heterogeneity across the studies in definitions of practice

Table 3. Patient reported-outcomes

Study ID	Patient-reported outcome	Patient population	Effects of practice size
Bower *et al*, 2003/ Campbell *et al*, 2001[15,16]	Patient centredness, continuity of care, communication, interpersonal care, doctor's knowledge of patient, nursing care, and overall satisfaction	General	No effect
	Access	General	Small practices (regression coefficient = 40.2; 95% CI = 25.5 to 54.9, *P*<0.001)
	Treatment by receptionist	General	Small practices (OR per unit increase in number of WTE GPs = 0.82; 95% CI = 0.74 to 0.90, *P*<0.001)
Baker, 1995/ Baker and Streatfield, 1996[20,21]			
Surgery satisfaction	General satisfaction	>16 years	Small practices (regression coefficient for total list size per 1000 = –0.78; SE = 0.18, *P*<0.001)
	Accessibility	>16 years	Small practices (regression coefficient for total list size per 1000 = –0.67; SE = 0.13, *P*<0.001)
	Availability	>16 years	Small practices (regression coefficient for total list size per 1000 = –1.90; SE = 0.33, *P*<0.001)
	Continuity of care	>16 years	Small practices (regression coefficient for total list size per 1000 = –1.47; SE = 0.35, *P*<0.001)
	Medical care	>16 years	Small practices (regression coefficient for total list size per 1000 = –0.70; SE = 0.12, *P*<0.001)
	Premises	>16 years	Small practices (regression coefficient for total list size per 1000 = –0.99; SE = 0.40, *P*<0.05)
Consultation satisfaction	Professional care, and depth of relationship	>16 years	No effect
	General satisfaction	>16 years	Small practices (regression coefficient for total list size per 1000 = –0.26; SE = 0.09, *P*<0.05)
	Perceived time	>16 years	Small practices (regression coefficient for total list size per 1000 = –0.28; SE = 0.11, *P*<0.005)
Kontopantelis *et al*, 2010[24]	Satisfaction with getting through on the phone	General	Small practices (OR per 1000 increase in patients = 0.319; *P*≤0.0001)
	Able to get appointment same day or in next 2 days	General	Small practices (OR per 1000 increase in patients = 0.616; *P*≤0.0001)
	Able to get appointment >2 days in advance	General	Small practices (OR per 1000 increase in patients = 0.407; *P*≤0.0001)
	Able to get appointment with particular GP	General	Small practices (OR per 1000 increase in patients = 0.556; *P*≤0.0001)
	Satisfaction with hours GP surgery open	General	Small practices (OR per 1000 increase in patients = 0.839; *P*≤0.0001)

OR = odds ratio. SE = standard error. WTE = whole-time equivalent.

size, types of independent variables, and outcome measures, the findings have to be interpreted with caution in view of the methodological limitations and external validity of the studies.

The higher specialist referral rates for eating disorders in larger practices may be a result of the greater number of sympathetic professionals available.[23] Also, larger practices may be more likely to incorporate guidelines for the diagnosis and treatment of ADHD, as solo practices may have poorer access to mental health services, limited insurance coverage, and other potential system barriers to the delivery of ADHD care.[29] The association of larger practices with better diabetes management also suggests that there may be positive effects of having a multidisciplinary team,[15,16] that shared care with nurses allowed for certain processes to be effectively performed by nurses,[32] or that larger practices simply have better information technologies to facilitate execution of clinical processes.[10]

The mixed results regarding the effects of larger practice sizes on preventive services could be due to methodological limitations, different settings, and varying independent variables and process measures across the studies. Although larger practices appeared to have performed better in certain clinical processes such as higher specialist referral rates for eating disorder and greater adherence to guidelines for the diagnosis and treatment of ADHD, these clinical processes were specific to the study and disease context, and, given that evidence was limited and inconsistent, it

would be difficult to make any meaningful generalisations regarding the association between practice size and clinical processes.

Of the two studies that investigated the effect of practice size on clinical outcomes, one study found a significant association between larger practices and lower random haemoglobin A1 values in patients with diabetes while the other found no association between practice size and the achievement of optimal blood pressure, cholesterol, and body mass index readings in patients with IHD. The contrasting result could be due to outcome measures being less sensitive to changes in quality of care as compared to process measures.[33]

For patient-reported outcomes, smaller practices were consistently found to be associated with better access to care and better patient satisfaction.[15,16,20,21,24] This may be because patients were more familiar with the few receptionists in smaller practices as compared to the many receptionists in larger practices.[21] Moreover, smaller practices are likely to have a lower volume of calls compared to larger practices, and therefore maintain a better ratio of administrative staff to calls, which would improve satisfaction with telephone access.[24] Smaller practices also tend to have fewer changes of doctors and more personal service,[20] compared to larger practices where the length of time spent during consultation is limited because of the large volume of patients. Nonetheless, although there was some evidence for smaller practices having better patient-reported outcomes, this was limited to certain outcomes such as access, and is specific to the population and context.

Strengths and limitations

There are limitations to the interpretation of this review. First, not all relevant studies may have been identified, as only studies in the English language from 1990 to 2010 were included in the search strategy. Secondly, the heterogeneity of the studies did not allow for a quantitative meta-analysis. Nonetheless, the estimated effects and confidence intervals have been reported to provide an assessment of the magnitude and meaning of the relationships between practice size and the various outcome variables. Lastly, there is a huge variation across countries in the way primary care is being delivered to patients, and also in the definition and measure of practice size. What one country may consider as a small practice may be viewed as a large practice in another country. Similarly, while one country measures practice size according to list size, another country defines practice size by the team size. Hence, it may be inappropriate to make global judgments about care in general practice from these data.

Comparison with existing literature

Although there was some evidence of larger practices performing better in certain process measures, and smaller practices performing better in selected patient-reported outcomes, the findings lacked consistency across the studies. Nonetheless, this suggests that the relationship between practice size and quality of care is not a simple one. Different types of practices may have different strengths.[16] In a review of 30 studies from the UK and US on the relationship between performance and size of primary care groups/trusts (defined as serving about 100 000 people), it was found that increased population sizes beyond 100 000 did not generate cost savings or improvements in overall performance.[34] Other studies have suggested that a practice size of 10 000 to 15 000 patients may be optimal for the average physician workload.[35] Ultimately, the optimal size of practices is dependent on the aims, functions, and tasks of the organisation, and there may not be one size that would suit all.[34]

Practice size is also not the only organisational characteristic that can influence the quality of medical care. Other organisational factors such as team climate, financial incentives, and time spent with the patient, may have a greater impact on the quality of care. Future research on these factors should be done to ascertain whether they are better predictors for quality of care in the primary care setting.

Implications for clinical practice

This review provides an updated synthesis of the evidence on the effects of practice size on the quality of care in primary care.[36] Only four of the 10 measures of clinical processes and one of two measures of clinical outcomes were significantly associated with larger practices. For patient-reported outcomes, there was some evidence that smaller practices had better patient-reported access, and higher patient satisfaction with surgery and consultations, and with treatment by receptionists. The findings of the review suggest that there is limited evidence available to support an association between practice size and the quality of care in primary care settings.

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REFERENCES

1. Alberta Primary Care Initiative. *What is primary care?* http://www.albertapci.ca/AboutPCNs/PrimaryCare/Pages/default.aspx (accessed 18 Jul 2013).
2. Department of Health and Children. *Primary care — a new direction. Quality and fairness — a health system for you.* Dublin: Stationery Office, 2001.
3. Palmer RH. Process-based measures of quality: the need for detailed clinical data in large health care databases. *Ann Intern Med* 1997; **127(8 pt 2):** 733–738.
4. Donabedian A, Bashshur R. *An introduction to quality assurance in health care.* New York: Oxford University Press, 2003.
5. Crosson FJ. The delivery system matters. *Health Aff* 2005; **24(6):** 1543–1548.
6. Mehrotra A, Epstein AM, Rosenthal MB. Do integrated medical groups provide higher-quality medical care than individual practice associations? *Ann Intern Med* 2006; **145(11):** 826–833.
7. Atenstaedt R. Single-handed or group practice, quality of care and patient satisfaction. *Br J Gen Pract* 2006; **56(525):** 301.
8. Gregory S. *General practice in England: an overview.* London, UK: The King's Fund, 2009.
9. Lin HC, Xirasagar S, Laditka JN. Patient perceptions of service quality in group versus solo practice clinics. *Int J Qual Health Care* 2004; **16(6):** 437–445.
10. Casalino LP. Which type of medical group provides higher-quality care? *Ann Intern Med* 2006; **145(11):** 860–861.
11. van den Hombergh P, Engels Y, van den Hoogen H, *et al.* Saying 'goodbye' to single-handed practices; what do patients and staff lose or gain? *Fam Pract* 2005; **22(1):** 20–27.
12. The International Society For Pharmacoeconomics and Outcomes Research (ISPOR). *Patient-reported outcomes.* http://www.ispor.org/terminology/default.asp (accessed 18 Jul 2013).
13. The Joanna Briggs Institute. *The Joanna Briggs Institute reviewers' manual.* Adelaide: The Joanna Briggs Institute, 2008.
14. Ng KP, Ng CWL. The effects of practice size on quality of care in primary care settings: a systematic review. *JBI Library of Systematic Reviews* 2012; **10(27):** 1549–1633.
15. Bower P, Campbell S, Bojke C, Sibbald B. Team structure, team climate and the quality of care in primary care: an observational study. *Qual Saf Health Care* 2003; **12(4):** 273–279.
16. Campbell SM, Hann M, Hacker J, *et al.* Identifying predictors of high quality care in English general practice: Observational study. *BMJ* 2001; **323(7316):** 784–787.
17. Abdelhamid AS, Maisey S, Steel N. Predictors of the quality of care for asthma in general practice: An observational study. *Fam Pract* 2010; **27(2):** 186–191.
18. Broadbent J, Maisey S, Holland R, Steel N. Recorded quality of primary care for osteoarthritis: An observational study. *Br J Gen Pract* 2008; **58(557):** 839–843.
19. Vedavanam S, Steel N, Broadbent J, *et al.* Recorded quality of care for depression in general practice: An observational study. *Br J Gen Pract* 2009; **59(559):** 94–98.
20. Baker R. Characteristics of practices, general practitioners and patients related to levels of patients' satisfaction with consultations. *Br J Gen Pract* 1996; **46(411):** 601–605.
21. Baker R, Streatfield J. What type of general practice do patients prefer? Exploration of practice characteristics influencing patient satisfaction. *Br J Gen Pract* 1995; **45(401):** 654–659.
22. Hippisley-Cox J, Pringle M, Coupland C, *et al.* Do single handed practices offer poorer care? Cross sectional survey of processes and outcomes. *BMJ* 2001; **323(7308):** 320–323.
23. Hugo P, Kendrick T, Reid F, Lacey H. GP referral to an eating disorder service: why the wide variation? *Br J Gen Pract* 2000; **50(454):** 380–383.
24. Kontopantelis E, Roland M, Reeves D. Patient experience of access to primary care: identification of predictors in a national patient survey. *BMC Fam Pract* 2010; **11:** 61.
25. Majeed A, Gray J, Ambler G, *et al.* Association between practice size and quality of care of patients with ischaemic heart disease: cross sectional study. *BMJ* 2003; **326(7385):** 371–372.
26. Pringle M, Stewart-Evans C, Coupland C, *et al.* Influences on control in diabetes mellitus: patient, doctor, practice, or delivery of care? *BMJ* 1993; **306(6878):** 630–634.
27. Thalanany M, Derrough T. Pneumococcal vaccination: uptake and coverage in primary care. *Qual Prim Care* 2005; **13(3):** 131–137.
28. Pham HH, Schrag D, Hargraves JL, Bach PB. Delivery of preventive services to older adults by primary care physicians. *JAMA* 2005; **294(4):** 473–481.
29. Rushton JL, Fant KE, Clark SJ. Use of practice guidelines in the primary care of children with attention-deficit/hyperactivity disorder. *Pediatrics* 2004; **114(1):** e23–e28.
30. Wenghofer EF, Williams AP, Klass DJ. Factors affecting physician performance: Implications for performance improvement and governance. *Healthc Policy* 2009; **5(2):** e141–e160.
31. de Koning JS, Klazinga N, Koudstaal PJ, *et al.* Quality of stroke prevention in general practice: Relationship with practice organization. *Int J Qual Health Care* 2005; **17(1):** 59–65.
32. Saxena S, Car J, Eldred D, *et al.* Practice size, caseload, deprivation and quality of care of patients with coronary heart disease, hypertension and stroke in primary care: national cross-sectional study. *BMC Health Serv* Res 2007; **7:** 96.
33. Mant J. Process versus outcome indicators in the assessment of quality of health care. *Int J Qual Health Care* 2001; **13(6):** 475–480.
34. Bojke C, Gravelle H, Wilkin D. *Is bigger better for primary care groups and trusts?* Manchester: National Primary Care Research and Development Centre, University of Manchester, 2001.
35. Wensing M, van den Hombergh P, Akkermans R, *et al.* Physician workload in primary care: What is the optimal size of practices? A cross-sectional study. *Health Policy* 2006; **77(3):** 260–267.
36. Bojke C, Gravelle H, Wilkin D. Is bigger better for primary care groups and trusts? *BMJ* 2001; **322(7286):** 599–602.